A1

This invention relates to a solar cell module, particularly to a two-side incidence type solar cell module capable of entering light from both front and rear surfaces provided with transparent front and rear surface members.

Please replace the Page 1, lines 11-16 with the following paragraph:

A2

Because solar light is unexhausted energy, a solar cell device for directly converting light energy into electrical energy has been developed as an energy source to substitute for environmentally harmful fossil fuels such as petroleum and coal. A plurality of solar cell elements are electrically connected in series or in parallel with each other to form a solar cell module and increase their output. The solar cell module can be used as a practical energy source.

Please replace the Page 1, lines 18-21 with the following paragraph:

A3

A conventional solar cell module which generates power on one side surface is so structured that a plurality of solar cell elements 110 between a front surface glass 100 and a rear surface member 101 are sealed with a transparent and insulative resin 102 such as EVA (ethylene vinyl acetate).

Please replace the Page 2, lines 17-24 with the following paragraph:

A4

In the meantime, a solar cell module should be weather proof in order to withstand long-term use outside. The above conventional two-side incidence type structure uses transparent material for the rear surface member. When a transparent resin film is used as the rear surface member, water is likely to enter as compared with a lamination film with a metal foil sandwiched with plastic films. Therefore, it is necessary to take water penetration

A4 Cont'd

into consideration. Although a film of small water vapor transmission rate has been proposed as a transparent resin film, it still requires to be improved.

Please replace the Page 3, lines 5-9 with the following paragraph:

A5

Furthermore, this invention was made to improve reliability of the solar cell module by reducing water reaching to the front surface glass when the rear surface member is resin film and suppressing the sodium ions deposited from the front surface glass from reaching the front surface of the solar cell elements.

Please replace the Page 3, lines 21-24 with the following paragraph:

A6

With the above structure, water entering though the rear surface resin film is blocked by the water transmission preventing layer and an increase of water contained in the sealing resin between the front surface glass and the solar cell elements can be prevented.

Please replace the Page 4, lines 4-5 with the following paragraph:

A7

The material having a smaller water vapor transmission rate than that of the sealing resin can block water entering through the rear surface resin film.

Please replace the Page 4 lines 16-17 with the following paragraph:

A8

The thin plate glass can prevent water transmission, and water entering through the rear surface resin film is blocked.

Please replace the Page 4, lines 22-25 with the following paragraph:

A9

With this structure, water entering through the rear surface resin film is blocked by the solar cell elements and the water transmission preventing layer, and an increase of

A9 contd

water contained in the sealing resin between the front surface glass and the solar cell elements.

Please replace the Page 5, lines 5-8 with the following paragraph:

A10

With this structure, water entering through the rear surface resin film is blocked by the solar cell elements and the water transmission preventing layer, and an increase of water contained in the sealing resin between the front surface glass and the solar cell elements.

Please replace the Page 7, lines 11-21 with the following paragraph:

A11

First of all, this invention was made on the following conditions. A solar cell module shown in Fig. 14 including a lamination film of an aluminum foil sandwiched with polyvinyl fluoride layers, and a solar cell module only including a PVF film are prepared, and a moisture proof test (JIS C8917) on the two modules conducted to examine causes of degradation of power generation performance by water entrance. In this test, the modules are put in a thermostatic bath of 85°C, 93% RH for approximately 1000 hours and the solar cell characteristics are examined. An acceptable value of output is higher than 95%. In this test, the modules are put in the thermostatic bath for 1000 hours. The rate of change in output is 99.0 % when the rear surface member is a lamination film, and the rate is 92.0 % when the PVF film of 50μ m is used.

Please replace the Page 8, lines 4-9 with the following paragraph:

A12

When the water enters the module, the sodium ions deposited from the front glass migrate in the resin containing water to reach the front surface of the solar cell element,

A12 Cont'd

and further diffuse inside the solar cell element to degrade the power generation performance of the solar cell. As a result, the power generation performance seems to degrade when the rear surface member is the resin film as compared with the lamination film.

Please replace the Page 8, lines 11-14 with the following paragraph:

A13

This invention was made to improve reliability of the solar cell module by reducing water reaching to the front surface glass when the rear surface member is the resin film and to suppress the sodium ions deposited from the front surface glass from diffusing to the front surface of the solar cell elements.

Please replace the Page 8, lines 18-24 with the following paragraph:

A14

One example of a solar cell element 1 used in this invention is explained by referring to Fig. 1. Fig. 1 is a schematic perspective view illustrating one example of a solar cell element capable of entering light from both front and rear surfaces. This solar cell element is so structured that intrinsic amorphous silicon is sandwiched between a single crystalline silicon substrate and an amorphous silicon layer (herein after referred as HIT structure) in order to reduce defects on the interface therebetween and improve hetero junction interface characteristics and is capable of entering light from both front and rear surfaces.

Please replace the Page 9, lines 1-18 with the following paragraph:

Sub B1 A15

As shown in Fig. 1, the solar cell element 1 includes an n-type single crystalline silicon substrate 10, an intrinsic amorphous silicon layer 11, and a p-type amorphous silicon layer 12 formed in this order. A transparent electrode 13 on a light receiving side formed of ITO (Iridium Tin Oxide) is formed on an entire surface of the p-type amorphous

Sub B1

A15 Cont'd

silicon layer 12, and a comb-shaped collector 14 of silver (Ag) or the like is formed on the transparent electrode 13 on a light receiving side. A rear surface of the substrate 10 has a BSF (Back Surface Field) structure which introduces an internal electric field on the rear surface of the substrate; a high dope n-type amorphous silicon layer 16 is formed with an intrinsic amorphous silicon layer 15 interposed on a rear surface side of the substrate 10. A transparent electrode 17 on a rear surface side formed of ITO is formed on an entire surface of the high dope n-type amorphous silicon layer 16, and a comb-shaped collector 18 of silver (Ag) or the like is formed thereon. The rear surface also has a BSF structure which the intrinsic amorphous silicon layer is sandwiched between the crystalline silicon substrate and a high dope amorphous silicon layer in order to reduce defects on the interface and improve characteristics of the hetero junction interface.

Please replace the Page 10, line 22 - page 11, line 2 with the following paragraph:

A16

Each of the layers is superimposed on the front surface glass 20, as shown in Fig. 2, and is retained in a vacuumed bath at approximately 100Pa. Then, this lamination structure is heated to 150°C and is pressed with a silicone sheet from the rear surface resin film 5 side by using atmospheric pressure. Through these processes, the EVA sheets 2, 3 are softened and are tentatively adhered. Then, it is retained for approximately one hour in a thermostatic bath of approximately 150°C, and the EVA sheets 2, 3 are cross-linked to form the solar cell module shown in Fig. 3.

Please replace the Page 11, lines 4-11 with the following paragraph:

Water entering through the rear surface resin film 5 is blocked by the water transmission preventing layer 7a and an increase of water in the EVA sheet 3 between the front surface glass 20 and the solar cell elements 1 can be prevented. As a result, sodium ions deposited on the front surface glass 20 are prevented from migrating so as to prevent degradation of power generation performance of the solar cell element.

A17

Please replace the Page 12, lines 17-20 with the following paragraph:

In the embodiment shown in Fig. 4, the EVA resin sheet 3 of 0.6mm in thickness is interposed between the front surface glass 20 and the solar cell element 1, and the EVA sheet 2 of 0.6mm in thickness is interposed between the solar cell element 1 and the water transmission preventing layer 7b.

A18

Please replace the Page 13, line 22- page 14, line 5 with the following paragraph:

In the third embodiment, a water transmission preventing layer 7c of a metal foil or butyl rubber is formed on a part corresponding to an interval between the solar cell elements 1, 1 on an outer side of the rear surface resin film 5 of PVF film of 50μ m in thickness as shown in Fig. 6. When the metal foil of aluminum or the like is used as the water transmission preventing layer 7c, it may be attached to the rear surface resin film 5 by using adhesive such as double sided adhesive tape. When moisture proof butyl rubber is used for the water transmission preventing layer 7c, the butyl rubber may be pasted to the part for forming the water transmission preventing layer 7c.

A19

Please replace the Page 15, lines 11-14 with the following paragraph:

With the structure of Fig. 8, water entering through the rear surface resin film 5 is blocked by the solar cell element 1 and the water transmission preventing layer 7d, and an increase of water in the EVA sheet 3 between the front surface glass 20 and the solar cell elements 1 can be prevented. As a result, a sodium ion deposited on the front surface glass 20 is prevented from migrating so as to prevent degradation of power generation performance of the solar cell element.

A20

Please replace the Page 16, line 24- page 17, line 4 with the following paragraph:

Water entering through the rear surface resin film 5 is blocked by the water transmission preventing layer 7e and a solar cell element 1, and an increase of water in the EVA sheet 3 between the front surface glass 20 and the solar cell elements 1 can be prevented. As a result, a sodium ion deposited on the front surface glass 20 is prevented from migrating so as to prevent degradation of power generation performance of the solar cell element.

A21

Please replace the Page 17, lines 10-14 with the following paragraph:

Then as shown in Fig. 11, two EVA resin sheets 3, 4 are interposed between the front surface glass 20 and the solar cell elements 1. The water transmission preventing layer 7e of a metal foil of aluminum or the like is interposed between the resin sheets 3, 4 so as to cover the interval between the solar cell elements 1, 1 by approximately 2mm.

A22

Please replace the Page 18, lines 6-11 with the following paragraph:

In the structure of Fig. 12, the water entering through the rear surface resin film 5 is blocked by the solar cell element 1 and the water transmission preventing layer 7e, and increase of water in the EVA sheet 3 between the front surface glass 20 and the solar cell

A23

A23 Cont'd

elements 1 can be prevented. As a result, a sodium ion deposited on the front surface glass 20 is prevented from migrating so as to prevent degradation of power generation performance of the solar cell element.

Please replace the Page 18, lines 13-20 with the following paragraph:

A24

A distance between the front surface glass 2 and the solar cell element 1 can be great as compared with the solar cell module of the fourth embodiment; for example the distance can be doubled of one which has the single EVA sheet of 0.6mm. As a result, time for the sodium ions deposited from the front surface glass 20 to reach to the solar cell element 1 can take longer. Therefore, time taken until starting degradation of power generation performance of the solar cell element can be prolonged and a solar cell module of high reliability capable of withstanding long-term use in the outside can be provided.

Please replace the Page 19, line 21 - page 20, line 2 with the following paragraph:

A25

Sample No. 1 is one that uses a lamination film which an aluminum foil, as a rear surface material, is sandwiched by PVF in order to prevent water entrance from a rear surface and seals the solar cell elements by using an EVA sheet between the front surface glass 20. The No. 2 sample is one that uses a PVF film as a rear surface material. The No. 3-9 samples are ones that have the structures respectively illustrated in the first through seventh embodiments of this invention. The conditions of each of the samples are the same except for the condition shown in the table and the solar cell element 1 has the HIT structure of two-side incidence type.

Please replace the Page 22, lines 1-2 with the following paragraph:

A26 The sealing resin of the above embodiments is EVA, and silicone resin, poly vinyl chloride, PVB (poly vinyl butyral), or polyurethane can be also used.

Please replace the Page 22, lines 11-14 with the following paragraph:

A27 The water vapor transmission rate is inversely proportional to the thickness; for example when the thickness is doubled, the water vapor transmission rate is halved. Therefore, when the thickness of the EVA sheet is 1.0mm, the water vapor transmission rate is 37.8g/m$^2\cdot$day.

Please replace the Page 25 lines 3-11 with the following paragraph:

A28 It can be said from the table 2 that the two-side incidence type structure prevents water transmission from the rear surface side. The water transmission preventing layer of this invention can prevent deposition of a sodium ion from the front surface glass and prevent degradation of power generation performance of the solar cell element. When the thickness of the rear surface resin film 5 increases and the water vapor transmission rate of it is less than 6.3g/m$^2\cdot$day, it can function as a water transmission preventing layer.

Please replace the Page 25, lines 11-13 with the following paragraph:

A29 The above embodiments uses the solar cell element of the HIT structure, but other types of solar cell modules using other crystalline solar cell elements and amorphous solar cell elements are applicable.

Please replace the Page 25, lines 15-18 with the following paragraph:

A30 As described above, this invention can provide a solar cell module of high reliability capable of suppressing deposition of sodium ion from the front surface glass, extending